The AIDE (Adaptive Integrated Driver-vehicle Interface) Integrated Project

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Project summary

Integrated project on automotive human-machine interaction (HMI)

Addresses IST strategic objective (10) "eSafety of road and air transport"

4 years duration

Started: March 04

Budget: 12.5 ME (Total), 7.3 ME (EU funding)

28 partners (~50/50 industry-academia division)

Part of the EUCAR Integrated Safety Program – close links to other related FP6 initiatives

AIDE core group: VTEC (coordinator), BMW, Bosch, CRF, ICCS, JRC, PSA and TNO

AIDE Partners

Industry	Research Institutes and others
Volvo Technology	European Commission Joint Research Centre (JRC)
BMW Group Forschung und Technik	INRETS
DaimlerChrysler	TNO
Ford-Werke	Institute of Communications and Computer Systems (ICCS)
Adam Opel	German Federal Highway Institute (BASt)
Peugeot Citroën Automobiles	CIDAUT
Renault Recherche Innvation	Swedish National Road and Transport Research Institute (VTI)
Centro Richerche de Fiat	VTT Technical Research Centre of Finland
Seat Centro Técnico	Centre for Research and Technology – Hellas
Robert Bosch	University of Stuttgart
Johnson Controls	University of Leeds
Siemens VDO	Linköping University
Motorola	University of Genova (DIBE)
KITE Solutions	ERTICO

Key issues in future automotive HMI design

1. Advanced Driver Assistance Systems (ADAS)

   - Support for the *primary task* (driving)

   - E.g. Collision Avoidance, Safe Following, Vision Enhancement

   - Key issues:

     - Natural coupling between warnings/feedback and required driver reaction

     - Behavioural adaptation

     - User acceptance and adoption

2. In-vehicle Information Systems (IVIS)

   - E.g. mobile phones, telematics services, infotainment

   - Induce *secondary task* that may interfere with driving

   - Key issues:

     - Distraction/workload (visual and cognitive)

     - Safe integration of nomad devices

Integration

Key issues:

- Prevent **interference** between systems (e.g. information presented simultaneously)
- Exploit **synergies** (reduce HW costs, enhance performance)
- Requirements on system architecture
- Adaptation to the driver state and /or the driving situation
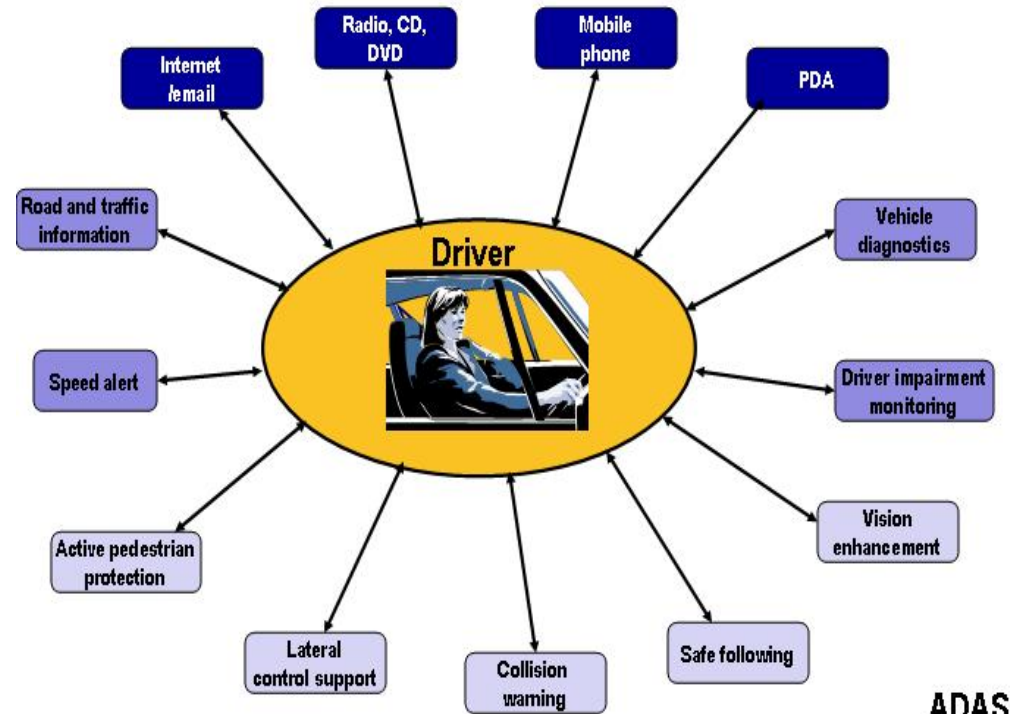
Market exploitation of adaptive integrated interfaces

- Key issues:
    - Technological development (HMI input/output devices, interaction management, HMI adaptivity and personalisation, DVE monitoring)
    - Standardisation:
        - Modular HMI system architecture standards (including interfacing to nomad devices)
        - Design standards for Integrated HMIs
        - Standardised evaluation methodology for integrated HMIs

Vision: The Adaptive Integrated Driver-vehicle Interface
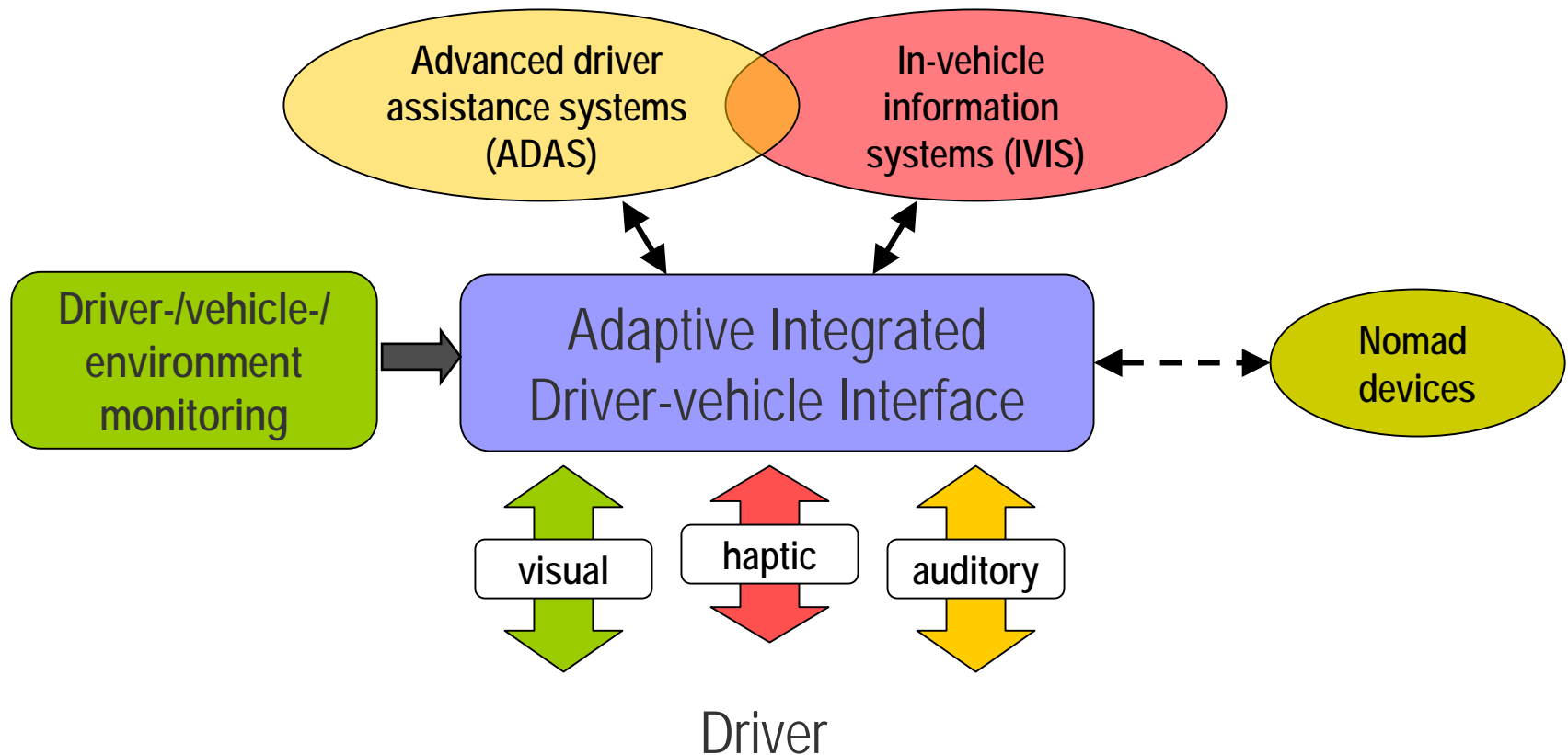
Related past- and ongoing work
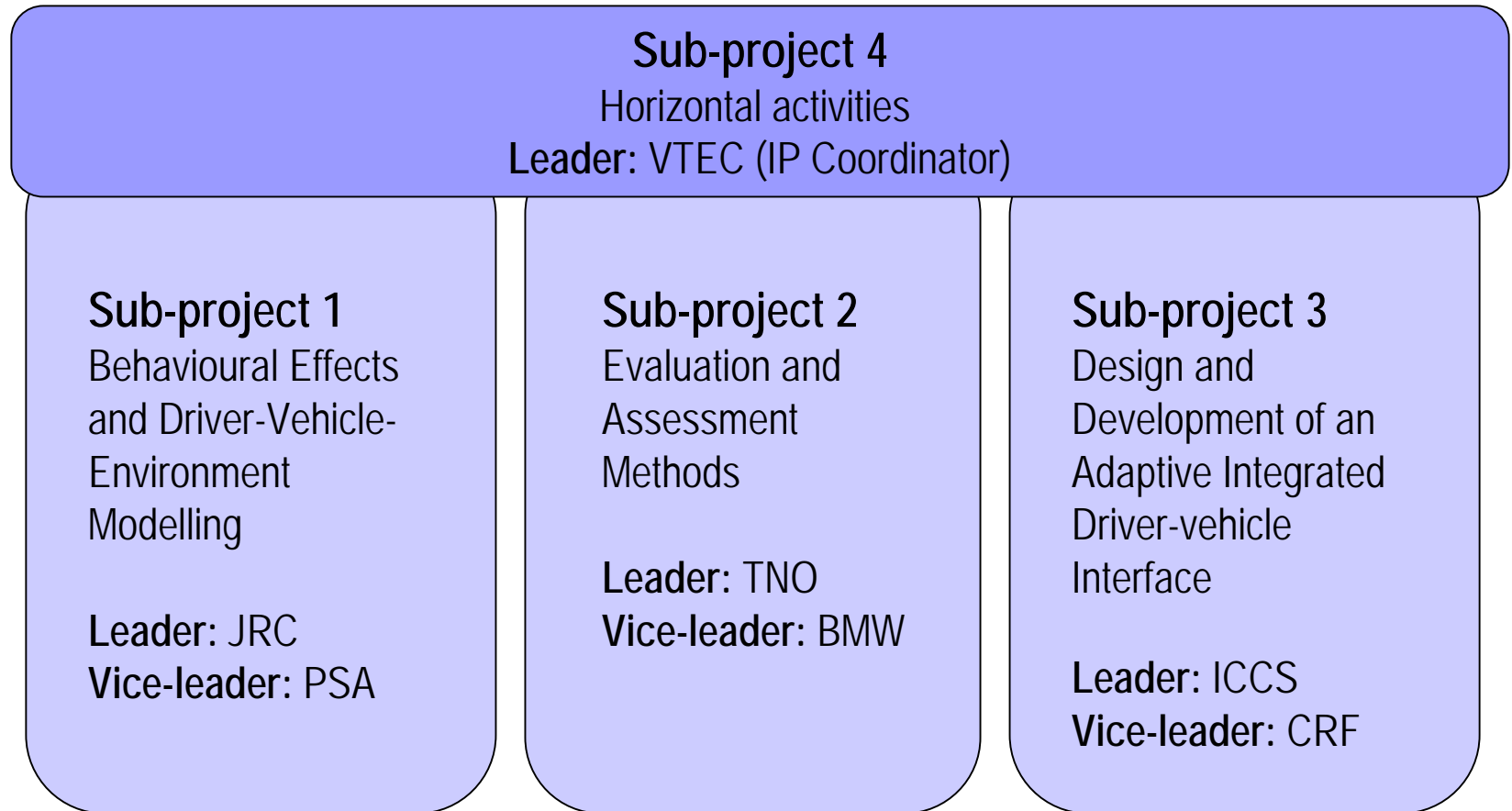
- Europe
  - Adaptive Integrated Interfaces: GIDS, ARIADNE, CEMVOCAS, COMUNICAR
  - Driver behaviour/evaluation methods: ADVISORS, RESPONSE, RoadSense, HASTE, ADAM

- US
  - SAVE-IT (ongoing, NHTSA-sponsored, similar to AIDE)

- Adaptive Integrated Driver-vehicle Interfaces is a hot topic, but still only very few systems on the market

AIDE objectives

- General objectives
    - Develop methodologies and technologies for safe and efficient integration of multiple ADAS and IVIS into the driving environment.
    - Bring these methodologies and technologies to the market!
- Sub-goals
    - **Model/simulation** of behavioural effects of ADAS and IVIS
    - Development of a standardised, industrially applicable, **evaluation methodology**
    - **Development** of an adaptive integrated driver-vehicle interface

Project structure

Sub-project 4
Horizontal activities
Leader: VTEC (IP Coordinator)

Sub-project 1
Behavioural Effects and Driver-Vehicle-Environment Modelling

Leader: JRC
Vice-leader: PSA

Sub-project 2
Evaluation and Assessment Methods

Leader: TNO
Vice-leader: BMW

Sub-project 3
Design and Development of an Adaptive Integrated Driver-vehicle Interface

Leader: ICCS
Vice-leader: CRF

Sub-project 1: Behavioural Effects and Driver-Vehicle-Environment Modelling

Objective: Develop a basic understanding of the driver-vehicle-environment (DVE) interaction and how it's affected by ADAS and IVIS

Key activities:

- Empirical studies on behavioural effects of ADAS/IVIS (learning, behavioural adaptation etc.)
- Modelling and simulation of the DVE system

Sub-project 2: Evaluation and Assessment Methods

Objective: Develop a generic, cost efficient and industrially applicable methodology for evaluating ADAS and IVIS

Key activities

- Development of **methods and tools for quantifying the behavioural effects** of in-vehicle systems (in particular workload, distraction and behavioural adaptation).

- Development of methods for **extrapolating from these effects to actual road safety**

- Development of a **general evaluation methodology** for application in different stages of product development, including standardised test scenarios. Linked to European Statement of Principles

- Applying the methodology to the **evaluation of the AIDE prototypes** (from SP3)

Sub-project 3: Design and development of an Adaptive Integrated Driver-vehicle Interface

Objective: Design, develop and demonstrate an adaptive integrated driver-vehicle interface

Key activities

- Technological benchmarking and definition of scenarios and use cases
- Requirements and specifications
- System architecture development
- Design of the adaptive integrated interface
    a. *Multimodal HMI and integration of nomad systems*
    b. *Intelligence for Interaction Management (Interaction and Communication Assistant)*
- Development of driver-vehicle-environment state (DVE) monitoring modules (to enable adaptivity)
- Prototype vehicles development (city car, luxury car and heavy truck)

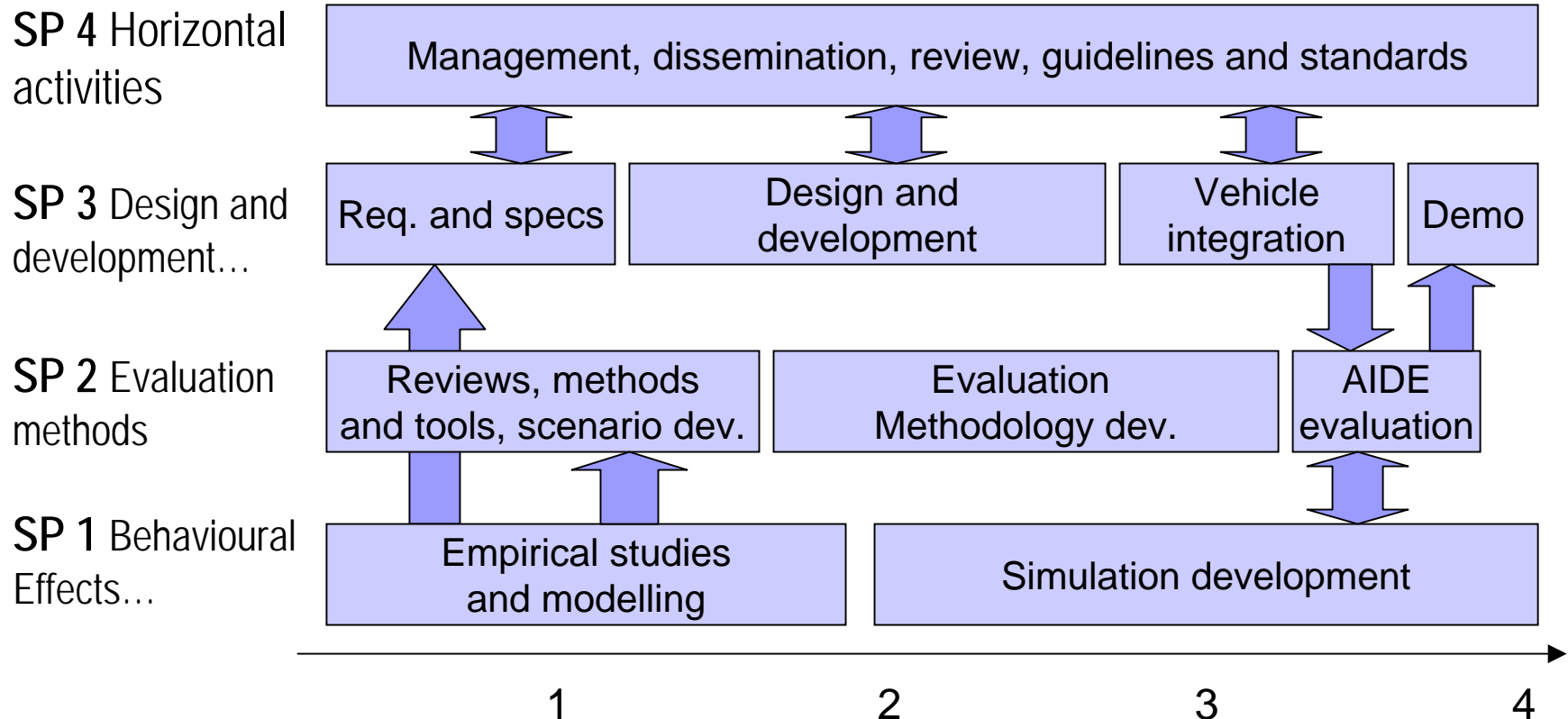## Sub-project 4: Horizontal activities

Objective: Gather activities that are common to SP1-3

Key activities:

– IP management

– Dissemination and exploitation

– Guidelines and standards

– Review and assessment of project results

Overview work plan

SP 4 Horizontal activities — Management, dissemination, review, guidelines and standards

SP 3 Design and development… — Req. and specs | Design and development | Vehicle integration | Demo

SP 2 Evaluation methods — Reviews, methods and tools, scenario dev. | Evaluation Methodology dev. | AIDE evaluation

SP 1 Behavioural Effects… — Empirical studies and modelling | Simulation development

1   2   3   4

AIDE open forums for dissemination and interaction with key stakeholders

User forum (leader: ICCS)

• Facilititate interaction with target user groups and other key stakeholders (industry, academia, governments, standardisation organisations etc.)
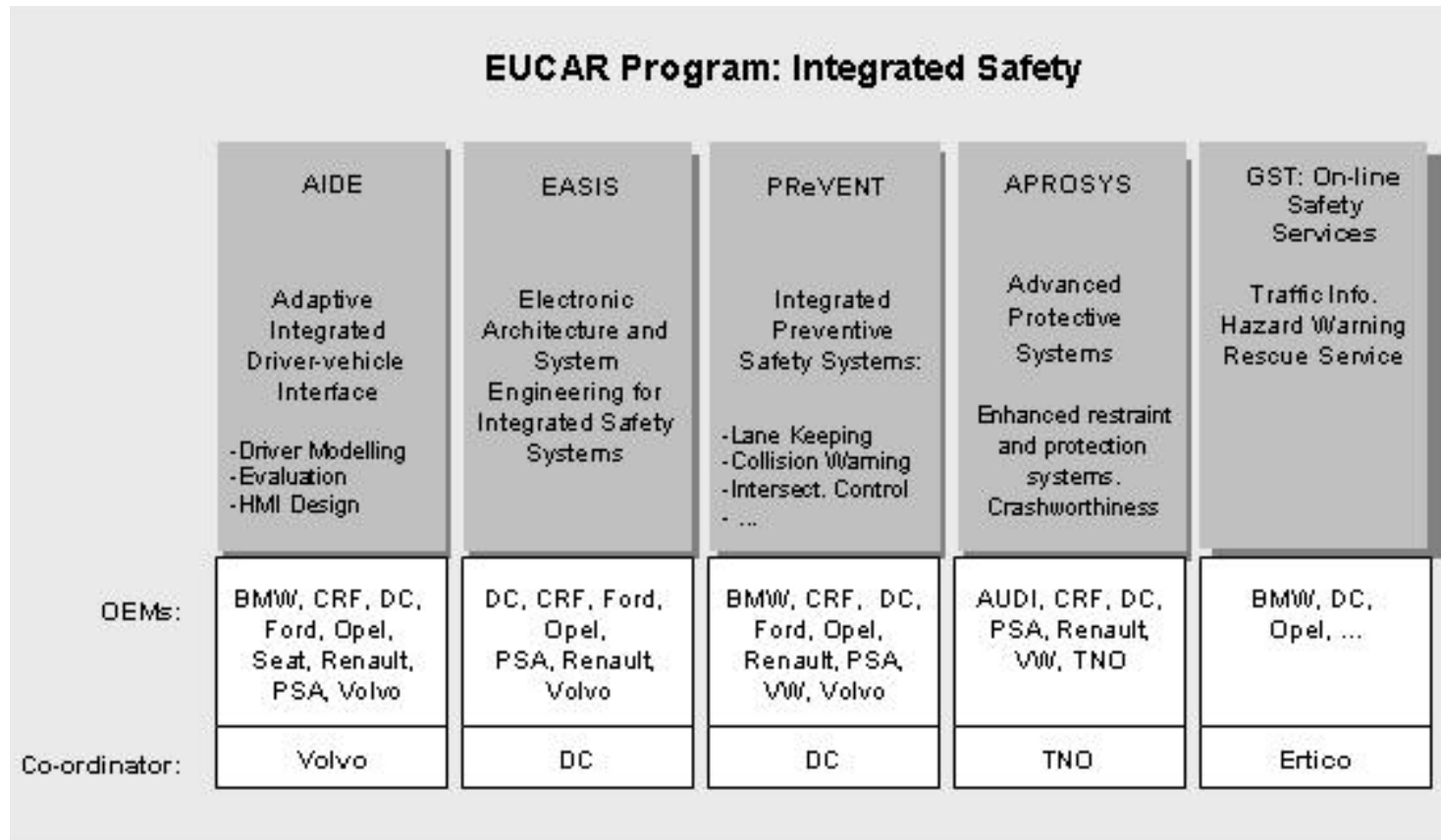
System architecture forum (leader: Bosch)

• Facilitate open discussion on HMI architecture

Nomad forum (leader: ERTICO)

• Facilitate open discussion between automotive and telematics industry (and other interested parties) on methods and techniques for safe integration of nomad devices

Interactions with other initiatives: The Integrated Safety Program

EUCAR Program: Integrated Safety

	AIDE	EASIS	PReVENT	APROSYS	GST: On-line Safety Services
	Adaptive Integrated Driver-vehicle Interface	Electronic Architecture and System Engineering for Integrated Safety Systems	Integrated Preventive Safety Systems:	Advanced Protective Systems	Traffic Info. Hazard Warning Rescue Service
	-Driver Modelling -Evaluation -HMI Design		-Lane Keeping -Collision Warning -Intersect. Control - ...	Enhanced restraint and protection systems. Crashworthiness	
OEMs:	BMW, CRF, DC, Ford, Opel, Seat, Renault, PSA, Volvo	DC, CRF, Ford, Opel, PSA, Renault, Volvo	BMW, CRF, DC, Ford, Opel, Renault, PSA, VW, Volvo	AUDI, CRF, DC, PSA, Renault, VW, TNO	BMW, DC, Opel, ...
Co-ordinator:	Volvo	DC	DC	TNO	Ertico

Interactions with other initiatives: Working level links

- EASIS (STREP)
  - Exchange of specifications for system architecture
- PReVENT (IP)
  - Exchange of specifications to ensure compatibility
  - Common demonstrator vehicle
- GST Online Safety Services (IP)
  - Exchange of specifications to ensure compatibility
- HUMANIST NoE
  - Common workshop at ITS Budapest on evaluation methodologies
  - Continous exchange of results
- **Strong overlap in partnership with all these initatives!**
- **Also: Initiated contact with the US SAVE-IT project**

Conclusion: Main technical outputs

- SP1: Model and simulation of behavioural effects of ADAS and IVIS

- SP2: Generic methodology for evaluating adaptive integrated interfaces

- SP3: Three prototype vehicles demonstrating the AIDE concept (validated by the methodology developed in SP2).

- SP4: General design guidelines and proposal for standards for adaptive integrated interfaces

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